CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A contactless power supply to inductively couple to a device comprising a tank circuit for inductively coupling to the device and a controller for dynamically reconfiguring the tank circuit.

2. The contactless power supply of claim 1 where the tank circuit has a variable capacitor.

3. The contactless power supply of claim 2 where the controller is coupled to the variable capacitor.

4. The contactless power supply of claim 3 where the tank circuit is coupled to an inverter.

5. The contactless power supply of claim 4 where a drive circuit is coupled to the inverter.

6. The contactless power supply of claim 5 where the inverter has an inverter frequency and the drive circuit regulates the inverter frequency.

7. The contactless power supply of claim 6 where the inverter has a duty cycle and the drive circuit regulates the duty cycle of the inverter.

8. The contactless power supply of claim 7 where a power source is coupled to the inverter.

9. The contactless power supply of claim 8 where the power source has a rail voltage and the rail voltage is alterable by the controller.

10. The contactless power supply of claim 9 where a sensor is coupled to the inverter.

11. The contactless power supply of claim 10 where the inverter has a duty cycle, and the controller, in response to information from the sensor, varies the duty cycle.

12. The contactless power supply of claim 11 where the inverter has an inverter frequency, and the controller, in response to information from the sensor, varies the inverter frequency.

13. The contactless power supply of claim 12 where the controller is coupled to a variable inductor.

14. The contactless power supply of claim 13 where the tank circuit is coupled to an inverter.

15. The contactless power supply of claim 14 where a drive circuit is coupled to the inverter.

16. The contactless power supply of claim 15 where the drive circuit regulates the inverter frequency.

17. The contactless power supply of claim 16 where the drive circuit regulates the duty cycle.

18. The contactless power supply of claim 17 where a power source is coupled to the inverter.

19. The contactless power supply of claim 18 where the power source has a rail voltage and the controller can change the rail voltage.

20. The contactless power supply of claim 19 where a sensor is coupled to the inverter.

21. The contactless power supply of claim 20 where the controller, in response to information from the sensor, varies the duty cycle of the inverter.

22. The contactless power supply of claim 21 further comprising a memory coupled to the controller.

23. The contactless power supply of claim 22 where the tank circuit includes a variable inductor.

24. The contactless power supply of claim 23 where the tank circuit is coupled to an inverter.

25. The contactless power supply of claim 24 where a drive circuit is coupled to the inverter.

26. The contactless power supply of claim 25 where the inverter has an inverter frequency and the drive circuit regulates the inverter frequency.

27. The contactless power supply of claim 26 where the inverter has a duty cycle, and the drive circuit regulates the duty cycle.

28. The contactless power supply of claim 27 where a power source is coupled to the inverter.

29. The contactless power supply of claim 28 where the power source has a rail voltage and the controller regulates the rail voltage.

30. The contactless power supply of claim 29 where a sensor is coupled to the inverter.

31. The contactless power supply of claim 30 where the controller, in response to information from the sensor, varies the duty cycle.

32. The contactless power supply of claim 31 where the controller, in response to information from the sensor, varies the inverter frequency.

33. A contactless power supply for inductively powering a device comprising:

a tank circuit;

a sensor for sensing operating parameters of the tank circuit;

and a controller coupled to the sensor for configuring the tank circuit in response to the sensor.

34. The contactless power supply of claim 33 where the tank circuit includes a variable capacitor.

35. The contactless power supply of claim 34 where the tank circuit includes a variable inductor.

36. The contactless power supply of claim 35 where the tank circuit includes a primary winding.

37. The contactless power supply of claim 36 where the primary winding and the variable inductor are separate.

38. The contactless power supply of claim 37 where the primary winding and the variable inductor are integral.

39. A contactless power supply comprising:

a tank circuit, the tank circuit having a resonant frequency and a variable element for changing the resonant frequency, the tank circuit being attachable to a source of AC power;

a sensor for detecting a power transfer efficiency from the tank circuit; and

a controller responsive to the sensor for changing the variable element if the power transfer efficiency is reduced.

40. A method of operating a contactless power supply to power a load, the contactless power supply having a tank circuit, the tank circuit having a resonant frequency, the tank circuit

also having an operating parameter, the tank circuit being inductively coupled to the load, comprising changing the resonant frequency in response to changes of the operating parameter.

41. The method of claim 40 where the tank circuit is coupled to an AC power source, the AC power source having an AC power source frequency, further comprising:

changing the AC power source frequency in response to changes of the operating parameter.

42. The method of claim 41 where the AC power source is an inverter, and the inverter has a duty cycle, further comprising changing the duty cycle in response to changes of the operating parameter.

43. The method of claim 42 where the inverter is coupled to a DC power source, the DC power source having a rail voltage, further comprising:

changing the rail voltage in response to changes of the operating parameter.

44. The method of claim 43 where the tank circuit has an adjustable capacitor, the adjustable capacitor having a capacitance, and adjusting the resonant frequency of the tank circuit comprises the step of changing the capacitance of the adjustable capacitor.

45. The method of claim 44 where the tank circuit has an adjustable inductor, the adjustable inductor having an inductance, and adjusting the resonant frequency of the tank circuit comprises the step of changing the inductance of the adjustable inductor.

46. The method of claim 45 where the tank circuit has an adjustable inductor, the adjustable inductor having an inductance, and adjusting the resonant frequency of the tank circuit comprises changing the inductance of the adjustable inductor.

47. The method of claim 46 where the tank circuit has an adjustable capacitor, the adjustable capacitor having a capacitance, and adjusting the resonant frequency of the tank circuit comprises the step of changing the capacitance of the adjustable capacitor.

48. The method of claim 44 or 47 where the inverter is coupled to a DC power source, the DC power source having a rail voltage, comprising the step of changing the rail voltage in response to the operating parameter.

49. The method of claim 48 where tank circuit has a tank circuit current, the tank circuit current has a phase, and the operating parameter is the phase..

50. A method of operating a power supply for a load, the power supply having a tank circuit inductively coupled to the load, the tank circuit having an adjustable resonant frequency, the power supply having an inverter, the inverter having a duty cycle and an inverter frequency, the inverter coupled to a DC power source, the DC power source having a rail voltage, the power supply having a sensor for detecting an operating parameter of the tank circuit, the operational parameter having a nominal range, comprising the steps of :

monitoring the operating parameter; and

if the operating parameter goes outside of the nominal range, changing the duty cycle to a second duty cycle value.

51. The method of claim 50 further comprising the step of:

if the operating parameter remains outside of the nominal range, changing the adjustable resonant frequency.

52. A method of operating a power supply to power a load, the power supply having a tank circuit, the tank circuit configurable to have a first resonant frequency and the tank circuit configurable to have a second resonant frequency, the tank circuit also having an operating

parameter, the operating parameter having a nominal range, the tank circuit being inductively coupled to the load, comprising:

configuring the tank circuit to have the first resonant frequency if the operating parameter is within the nominal range; and

configuring the tank circuit to have the second resonant frequency if the operating parameter is not within the nominal range.

53. The method of claim 52 where the power supply has an inverter supplying power to the tank circuit, the inverter having a first inverter frequency and a second inverter frequency, comprising the steps of:

operating the inverter at about the first inverter frequency if the operating parameter is within the nominal range; and

operating the inverter at about the second inverter frequency if the operating parameter is not within the nominal range.

54. The method of claim 53 where the power supply has a memory including the steps of:

storing the operating parameter in the memory as a first operating value when the tank circuit is configured to operate at the first resonant frequency; and

storing the operating parameter in the memory as a second operating value when the tank circuit is configured to operate at the second resonant frequency.

55. The method of claim 54 including the step of:

if the operating parameter is not within the nominal range when the inverter is operating at the first inverter frequency or the second inverter frequency:

determining whether the first operating value or the second operating value is preferable; and

configuring the power supply to operate so as to produce either the first operating value or the second operating value.

56. The method of claim 55 further comprising the step of:

if the first operating value is preferable, storing the first operating value in the memory as an expected operating value; and

if the second operating value is preferable, storing the second operating value in the memory as the expected operating value.